Structural and spectroscopic in vivo imaging of the human retina with scanning light ophthalmoscopy

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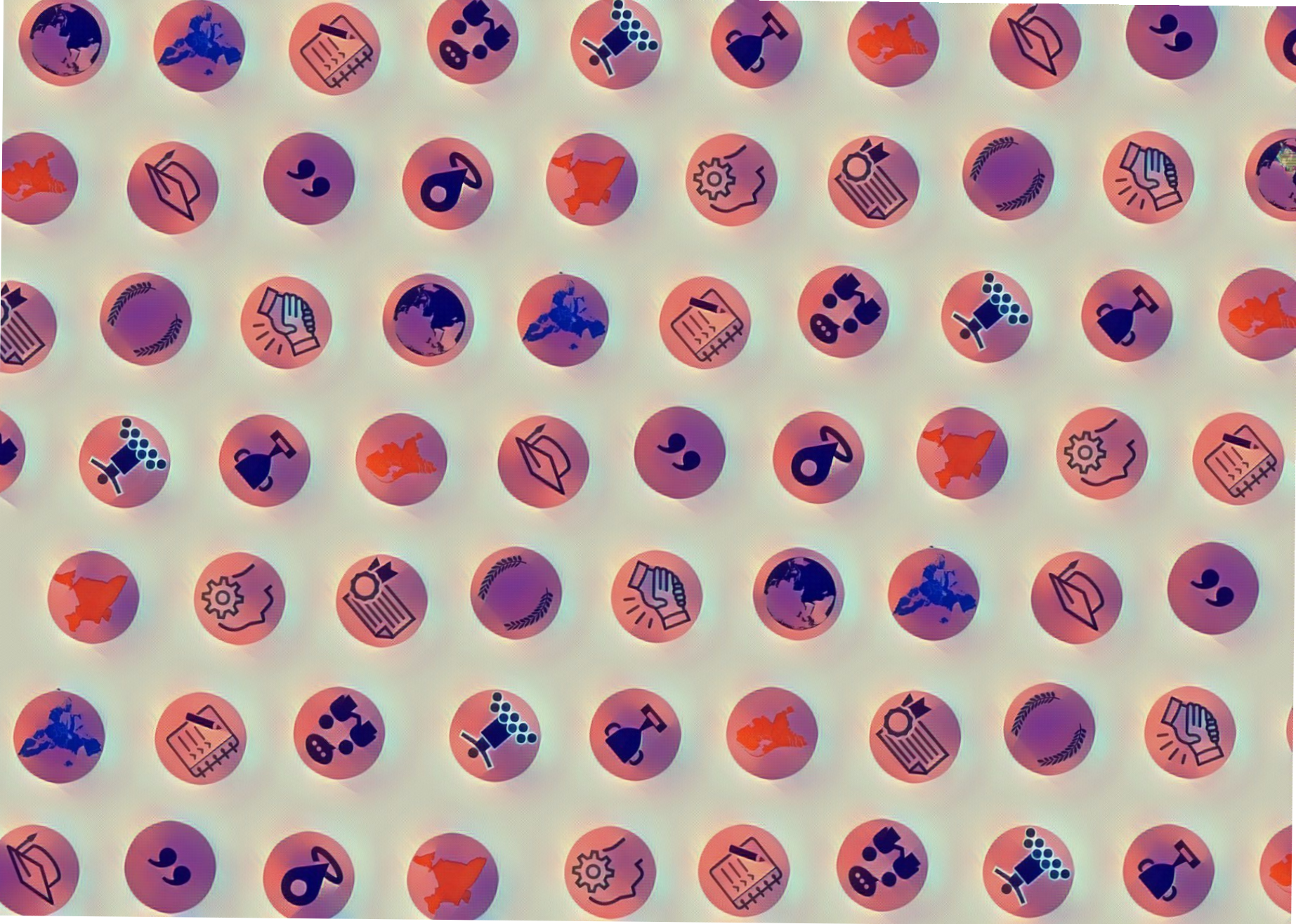

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Curriculum Vitae

Mathivanan (Mathi) Damodaran was born on October 9^{th}, 1989 in Dharmapuri, Tamil Nadu, India. He obtained his Bachelor of Engineering degree in Electronics and Communication Engineering (ECE) in 2011 from Anna University, Chennai. For his Bachelor's degree, he did an internship at the Indian Institute of Technology (IIT, Madras) on 'fibre lasers'. He joined the Erasmus Mundus MSc. in Photonics program and did his masters course in three different universities namely, Universiteit Gent (Gent, *Belgium*), Kungliga tekniska högskolan (Stockholm, *Sweden*) and University of St.Andrews (St.Andrews, *Scotland*). He completed the master's degree in 2013. As part of his master's degree, he did an internship on optics design for a compact hand-held probe for fluorescence lifetime imaging in Advanced Quantum Architecture Lab (AQUA) (Ecole Polytechnique fédérale de Lausanne, *Switzerland*). The master's thesis was done in the Synthetic Optics group at the School of Physics and Astronomy, (St.Andrews Scotland) on 'All-optical manipulation of 2D polymeric membranes'. In October 2013, Mathi started as a PhD candidate at the imaging group of the Rotterdam Ophthalmic Institute and in June 2014, he moved to the Biophotonics and Imaging group in the Department of Physics and Astronomy, Vrije Universiteit Amsterdam to finish his research which culminated in this thesis. In December 2018, He took the position as a scientist in Philips Research (Eindhoven, *The Netherlands*).

Awards and Honours

- Erasmus Mundus scholarship for 2 years of Msc. study
- Poster Award at the BIGSS Graduate Summer School 2014
- International Travel Grant, ARVO Annual meeting 2017

Patents

- Retinal oximetry with improved accuracy (pending, 2019)

Conference presentations

- **Confocal imaging of the retina using DMD based ophthalmoscope** *Biophotonics and imaging graduate summer school* 2014, Galway, *Ireland*.
- ***In vivo* confocal imaging of the retina using patterned illumination**, oral presentation, *Emerging Digital Micromirror Device Based Systems and Applications VII*, SPIE photonics west, February 2015, San Francisco, *USA*.

- **Digital micromirror device based multispectral retinal imaging using optimized illumination schemes**, oral presentation, *Emerging Digital Micromirror Device Based Systems and Applications VIII*, SPIE photonics west, February 2016, San Francisco, *USA*.
- **Multispectral Scanning Light Ophthalmoscope (MSLO) using optimized illumination schemes**, poster presentation, *ARVO Annual Meeting* May 2016, Seattle, *USA*.
- **Dual wavelength scanning light ophthalmoscope using digital micromirror device**, oral presentation, *Ophthalmic Technologies XXVII*, SPIE photonics west, January 2017, San Francisco, *USA*.
- **Dual wavelength Scanning Light Ophthalmoscope with concentric circle scanning**, poster presentation, *ARVO Annual Meeting* May 2017, Baltimore, *USA*.
- **Choosing optimum wavelength combination for retinal vessel oximetry: Effect of haemoglobin packaging**, oral presentation, *Imaging, Manipulation, and Analysis of Biomolecules, Cells, and Tissues XVI*, SPIE photonics west, January 2018, San Francisco, *USA*.
- **DMD based ophthalmoscope with concentric circle scanning for fixation**, oral presentation, *Emerging Digital Micromirror Device Based Systems and Applications X*, SPIE photonics west, January 2018, San Francisco, *USA*.
- **Sub-diffuse scanning laser oximetry in the retina using optimum wavelengths**, poster presentation, *ARVO Annual Meeting*, May 2018, Honolulu, *USA*.

Publications list

Publications (partly) included in the thesis:

- **M. Damodaran**, K. V. Vienola, B. Braaf, K. A. Vermeer, and J. F. de Boer, "Digital micromirror device based ophthalmoscope with concentric circle scanning," Biomed. Opt. Express 8, (2017).
- K. V. Vienola, **M. Damodaran**, B. Braaf, K. A. Vermeer, and J. F. De Boer, "In vivo retinal imaging for fixational eye motion detection using a high-speed digital micromirror device (DMD)-based ophthalmoscope," Biomed. Opt. Express 9, 591-602 (2018).

- **M. Damodaran**, A. Amelink, and J. F. de Boer, "Optimal wavelengths for sub-diffuse scanning laser oximetry of the human retina," J. Biomed. Opt. 23, 1 (2018).
- **M. Damodaran**, A. Amelink, and J. F. de Boer, "Non-invasive optical measurement of haematocrit in the posterior eye of adult humans," *manuscript in preparation*.
- **M. Damodaran**, A. Amelink, F. Feroldi, B. Lochocki, V. Davidoiu, and J. F. de Boer, "In vivo subdiffuse scanning laser oximetry of the human retina," J. Biomed. Opt. 24, 1 (2019).
- K. V. Vienola, **M. Damodaran**, B. Braaf, K. A. Vermeer, and J. F. de Boer, "Parallel line scanning ophthalmoscope for retinal imaging," Opt. Lett. 40, 5335-5338 (2015).

Publications outside the thesis:

- **M. Damodaran**, K. V. Vienola, B. Braaf, K. Vermeer, and J. F. De Boer, "Multispectral Scanning Light Ophthalmoscope (MSLO) using optimized illumination schemes," Invest. Ophthalmol. Vis. Sci. 57, 1697 (2016).
- **M. Damodaran**, K. V Vienola, K. A. Vermeer, and J. F. De Boer, "Dual wavelength Scanning Light Ophthalmoscope with concentric circle scanning," Invest. Ophthalmol. Vis. Sci. 58, 3132 (2017).
- **M. Damodaran**, A. Amelink, and J. F. De boer, "Sub-diffuse scanning laser oximetry in the retina using optimum wavelengths," Invest. Ophthalmol. Vis. Sci. 59, 4656 (2018).
- A. Bekal, **M. Damodaran**, D. Venkitesh, and B. Srinivasan, "Optimization of cavity configuration of a Q-switched fibre LASER," Proc. SPIE - Int. Soc. Opt. Eng. 8173, 17 (2011).